

FLOW-THROUGH VERSUS STATIC BIOASSAY SYSTEMS: AN EVALUATION

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Flow-through Versus Static Bioassay Systems: An Evaluation. S. M. Warlen and D. W. Engel. Toxicity of copper to juvenile pinfish, *Lagodon rhomboides* (Linnaeus), 12 to 20 mm long (total length), was determined in both static and flow-through seawater bioassay systems. In both systems the fish were exposed to nominal copper concentrations (added as CuCl_2) ranging from 0.05 to 1.0 ppm. Survival was affected by copper concentration, exposure time, and bioassay technique. Copper was more toxic in the flowing system than in the static one; all fish tested in the flow-through system died in total copper concentrations of 0.125 ppm or greater while those in the static system survived concentrations up to 0.25 ppm but not > 0.5 ppm. Median lethal concentrations (LC_{50} s) showed no significant changes ($p > 0.05$) with exposure time in the static system, but a significant decreasing trend ($p < 0.05$) with exposure time was observed in the flow-through system.

We hypothesize that the difference in toxicity between the two systems was due to a difference in the fraction of copper which remained biologically available in the water. A decrease in biologically available copper in the static system may have resulted from adsorption, flocculation, and complexation of copper by biologically generated organic compounds. This decrease in availability could account for the decreased toxicity of copper in the static system. In the flow-through system, however, the complexed or bound metal was continuously replaced by inflowing copper solution. Although total copper concentration remained constant in both systems, differences in the amount of ionic copper could account for the apparent greater toxicity of copper in the flow-through system.

We feel that flow-through systems generally give more reliable and applicable information in metals bioassays than can be obtained with the static systems. The use of flow-through systems is essential in bioassays where it is necessary to prevent or reduce changes in the concentration of the test toxicant due to complexation, volatilization, degradation, bioaccumulation, or adsorption of the toxicant. (Contribution Number 78-25B, National Marine Fisheries Service, NOAA Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC 28516.)